

Nuclear Energy, Science and Technology – Energy Supply

(dollars in thousands)					
	FY 2002 Comparable Approp	FY 2003 Amended Request	FY 2004 Request to Congress	FY 2004 vs. FY 2003	
Nuclear Energy, Science, and Technology					
University reactor fuel assistance and support.....	17,500	17,500	18,500	+1,000	+5.7%
Research and development					
Nuclear energy plant optimization.....	6,293	—	—	—	—
Nuclear energy research initiative.....	31,081	25,000	12,000	-13,000	-52.0%
Nuclear energy technologies.....	11,867	46,500	48,000	+1,500	+3.2%
Nuclear hydrogen initiative.....	—	—	4,000	+4,000	n/a
Advanced fuel cycle initiative.....	77,219	18,221	63,025	+44,804	+245.9%
Total, Research and development.....	126,460	89,721	127,025	+37,304	+41.6%
Infrastructure					
Radiological facility management.....	58,933	54,180	62,655	+8,475	+15.6%
Idaho facilities management					
ANL-West operations.....	34,857	31,615	31,615	—	—
INEEL infrastructure.....	28,432	36,810	33,945	-2,865	-7.8%
Total, Idaho facilities management.....	63,289	68,425	65,560	-2,865	-4.2%
Idaho sitewide safeguards and security.....	43,759	43,218	56,654	+13,436	+31.1%
Total, Infrastructure.....	165,981	165,823	184,869	+19,046	+11.5%
Program direction.....	57,237	56,834	60,207	+3,373	+5.9%
Subtotal, Nuclear Energy, Science, and Technology.....	367,178	329,878	390,601	+60,723	+18.4%
Use of prior year balances and other adjustments.....	-4,282	-3,003	-3,003	—	—
Total, Nuclear Energy, Science, and Technology.....	362,896	326,875	387,598	+60,723	+18.6%

PROGRAM DESCRIPTION

The **Nuclear Energy, Science and Technology (NE)** program promotes secure, competitive, and environmentally responsible nuclear technologies to serve the present and future energy needs of the country. As we become more conscious of the significant energy and environmental challenges facing the United States and the world in this new century, the benefits of nuclear fission as a key energy source for both the near- and long-term energy future of America are increasingly apparent. A key mission of DOE's nuclear energy research and development program is to help enhance that basic technology and, through some of the most advanced civilian technology research conducted today, chart the way toward the next leap in technology. With these efforts and those of industry and our overseas partners, nuclear energy will fulfill its promise as a safe, advanced, inexpensive, and environmentally benign approach to providing reliable energy to all the world's people.

The programs within NE fully support **National Energy Policy** recommendations to expand the use of nuclear energy in the United States. Specifically, the new **Nuclear Hydrogen Initiative** will develop advanced technologies that can be used in tandem with next-generation nuclear energy plants to generate economic, commercial quantities of hydrogen to support a sustainable, clean energy future for the United States. The **Generation IV Nuclear Energy Systems Initiative** establishes a basis for expansive cooperation with our international partners to develop next-generation reactor and fuel cycle systems that represent a significant leap in economic performance, safety, and proliferation-resistance. The **Advanced Fuel Cycle Initiative** program

will focus technologies enabling the reduction of spent fuel volume, the separation of long-lived, highly toxic elements in spent fuel, and reclaiming spent fuel's valuable energy.

PROGRAM HIGHLIGHTS

The FY 2004 request supports innovative applications of nuclear technology to deploy new nuclear generation to meet energy and climate goals, maximize energy from nuclear fuel, protect existing nuclear generation to support the National Energy Policy objectives, and maintain and enhance national nuclear capabilities to meet future challenges. In addition, the FY 2004 request reflects the decision to transfer landlord responsibility of the Idaho National Engineering and Environmental Laboratory (INEEL) from the Office of Environmental Management to NE.

The **University Reactor Fuel Assistance and Support** program supports the operation and upgrade of university research and training reactors; provides fellowships and scholarships to outstanding students, brings nuclear technology education to small, minority-serving institutions, and provides nuclear engineering research grants. The program helps to maintain domestic capabilities to conduct research and the critical infrastructure necessary to attract, educate, and train the next generation of scientists and engineers with expertise in nuclear energy technologies. The Nuclear Engineering Education Research program stimulates innovative research at U.S. universities. This program continues to support four university consortiums and provides funding for additional university consortium in FY 2004 within the Innovations in Nuclear Infrastructure and Education initiative. DOE also provides the supply of fresh fuel to and transport of spent fuel from university research reactors and supports reactor equipment upgrades at universities.

The **Nuclear Energy Research Initiative** program funds innovative investigator-initiated, peer-reviewed R&D at U.S. universities, national laboratories, and industry to improve the performance of U.S. light water reactor technology and develop concepts to solve issues inhibiting the long-term growth of nuclear power.

The **Nuclear Energy Technologies** program is working to identify, assess, and develop cost-efficient technologies that further enhance nuclear safety, minimize the generation of nuclear waste, and further reduce the risk of proliferation. In FY 2004, the **Nuclear Power 2010** program, a secretarial initiative, will continue to aggressively pursue demonstration of key regulatory approval processes, foster the completion of cost-effective, advanced nuclear plant designs and develop gas-cooled reactor technologies in order to pave the way for the deployment of new, advanced nuclear plants in the United States by 2010. Developing the next-generation nuclear systems will be an essential aspect of the **Generation IV Nuclear Energy Systems Initiative**. Through this effort, the United States will lead multi-national research and development projects to usher forth next-generation nuclear reactors and fuel cycles based on the results of the internationally endorsed **Generation IV Technology Roadmap**. This international approach allows for the development of technologies that are widely acceptable, enables DOE to access the best expertise in the world to develop complex new technologies, and allows us to leverage our scarce nuclear R&D resources.

With its new **Nuclear Hydrogen Initiative**, DOE will develop new technologies to generate hydrogen on a commercial scale in an economic and environmentally benign manner. DOE's Offices of Nuclear Energy, Fossil Energy, and Energy Efficiency and Renewable Energy are working in coordination to provide the technological underpinnings of the Administration's **FreedomFuel** initiative. In the case of nuclear energy, DOE will conduct research and development into advanced thermochemical technologies which may, when used in tandem with next-generation nuclear energy systems, enable the United States to generate hydrogen at a scale and cost that would support a future, hydrogen-based economy. Current fossil-fuel-based methods emit greenhouse gases and are roughly four times more costly than the market will support.

The **Advanced Fuel Cycle Initiative** (previously funded in the Spent Fuel Pyroprocessing and Transmutation program) will develop technologies that can reduce the volume and long-term toxicity of high-level waste from spent nuclear fuel, reduce the long-term proliferation threat posed by civilian inventories of plutonium in spent fuel, and provide for proliferation-resistant technologies to recover the energy content in spent nuclear fuel. This research is integral to the Generation IV Nuclear Energy Systems effort.

The **Radiological Facilities Management** program provides funding that will maintain critical user facilities in a safe, secure, environmentally-compliant and cost-effective manner to support national priorities. The facilities and infrastructure activities previously funded in the Advanced Radioisotope Power Systems and Medical Isotope programs are included in this program. The titles of these programs have been changed to **Space and Defense Infrastructure** and **Medical Isotope Infrastructure** to more accurately reflect the activities being performed at NE managed research and production user facilities. In addition, this program includes funding to transfer heat source and power systems assembly and testing operations for radioisotope power systems from the Mound Plant in Ohio to Argonne National Laboratory–West in Idaho.

On July 15, 2002, Secretary of Energy Spencer Abraham announced a major mission realignment for the INEEL, establishing the laboratory as the Nation's leading center for nuclear energy research and development. The INEEL will become the "command center" for NE nuclear energy research and development enterprise, including the lead role in the development of DOE's next-generation nuclear reactor and fuel cycle systems and space nuclear power and propulsion systems.

The **Idaho Facilities Management** program reflects the Secretary's decision to transfer landlord activities associated with INEEL from EM to NE, as well as merging activities associated with the Test Reactor Area Landlord previously funded in NE's Radiological Facilities Management program. In addition, the program includes funding for operational activities associated with the ANL-W facilities that were previously funded under the Radiological Facilities Management program.

The **Idaho Sitewide Safeguards and Security** program reflects the transfer of the responsibility to manage safeguards and security activities for INEEL and ANL-W from EM to NE. This program protects DOE interests from theft, diversion, sabotage, espionage, unauthorized access, compromise, and other hostile acts, which may cause unacceptable adverse impacts on national security, program continuity, the health and safety of employees, the public, or the environment at the INEEL and the ANL-W.

SIGNIFICANT FUNDING CHANGES – FY 2003 to 2004 Request (\$ in millions)

University Reactor Fuel Assistance and Support (FY 2003 \$17.5; FY 2004 \$18.5)..... +\$1.0

In FY 2004, DOE is expanding efforts to assist universities in continuing the integration of academic and reactor research in the Innovations in Nuclear Infrastructure and Education initiative.

Nuclear Energy Research Initiative (NERI) (FY 2003 \$25.0; FY 2004 \$12.0)..... -\$13.0

In FY 2004, research activities on 11 NERI projects initiated in FY 2000 and 2001 will be completed. Program will also complete the funding of the projects initiated in FY 2002. In addition, DOE will continue the bilateral international projects initiated in FY 2002 and 2003. No new research grants will be awarded in FY 2004.

Nuclear Energy Technologies (FY 2003 \$46.5; FY 2004 \$48.0) +\$1.5

FY 2004 request will continue the competitively selected cooperative Early Site Permit (ESP) demonstration project with resolution of site-specific issues arising from the Nuclear Regulatory Commission review of the ESP applications submitted in FY 2003. DOE will also finalize selection and award a utility cost-shared project to demonstrate the Construction/Operating licensing

process. Further, the program will complete the nuclear construction technology assessment initiated in FY 2003; initiate the design of the gas-cooled fuel irradiation test fixture; develop new coating technology for gas reactor fuel; and initiate fuel characterization methods. (Nuclear Power 2010, FY 2003 \$35.3; FY 2004 \$35.0). The Generation IV Nuclear Energy Systems research and development will focus on concept specific activities for the Very High Temperature Reactor, Supercritical Water Cooled Reactor, Gas-Cooled Fast Reactor, and the Lead-Cooled Fast Reactor. In addition, crosscutting activities will be conducted such as initiating mechanical tests and irradiation tests on commercially-available materials and advanced materials and validating computer models for use in design and safety analysis applications. (Generation IV, FY 2003 \$7.8; FY 2004 \$9.7). Request also includes \$2.3 for National Climate Change Initiative.

Nuclear Hydrogen Initiative (FY 2003 \$0; FY 2004 \$4.0) +\$4.0

In FY 2004 as part of the FreedomFuel Initiative, DOE is proposing a new program focused on producing nuclear-based hydrogen in an environmentally friendly and economic manner. The request provides funds to develop a Nuclear Hydrogen Technology Roadmap and initiate work on a facility concept that integrates a nuclear hydrogen production system with an advanced reactor design.

Advanced Fuel Cycle Initiative (FY 2003 \$18.2; FY 2004 \$63.0) +\$44.8

FY 2004 request reflects an increase to enable the development of technologies to significantly reduce the volume of spent fuel requiring geologic disposal and reduce inventories of civilian plutonium contained in spent fuel (+\$32.2). Request reflects an increase to enable the development of advanced fuels and fuel recycle technologies, demonstration of toxicity reduction through irradiation testing, and evaluation of long-term waste forms (+\$5.1). In addition, the request includes an increase to provide fellowships to expand the number of Master and Ph.D. graduate engineers and scientists within the Transmutation Science Education initiative (+\$7.5).

Radiological Facilities Management (FY 2003 \$54.2; FY 2004 \$62.7) +\$8.5

FY 2004 request includes an increase to the **Space and Defense Infrastructure** program previously called the Advanced Radioisotope Power Systems program. This increase includes funding for the transfer of the radioisotope power system operations from the Mound facility in Ohio to the Argonne National Laboratory–West facility in Idaho (+\$8.3). Request includes increases to operate the full scale scrap recovery line and purchase a DC arc analyzer required to analyze the purity of Pu-238 at Los Alamos National Laboratory (+\$1.2), to refine iridium scrap so the iridium material can be reused, and to replace aging equipment at the iridium fabrication facility at Oak Ridge National Laboratory (+\$0.3). In addition, the request includes a decrease in the **Medical Isotopes Infrastructure** program previously called the Medical Isotopes program. This decrease is due to the completion of the Los Alamos Isotope Production Facility in FY 2003 (-\$1.7), offset by small increases to permit needed minor repairs and support on-time maintenance requirements (+\$0.4).

Idaho Facilities Management (FY 2003 \$68.4; FY 2004 \$65.6) -\$2.8

FY 2004 request will reduce the Test Reactor Area maintenance backlog by 20 percent (+\$1.6). This increase is offset by delaying some general plant projects and the purchasing of some capital equipment to future years (-\$4.4).

Idaho Site-Wide Safeguards and Security (FY 2003 \$43.2; FY 2004 \$56.6) +\$13.4

FY 2004 request includes increases in physical security to support heightened security requirements resulting in increased posts, patrols, and other safeguards and security activities (+\$11.6). In addition, the request provides an increase for the continuation of current cyber security initiatives (+\$1.8).

Program Direction (FY 2003 \$56.8; FY 2004 \$60.2) +\$3.4

FY 2004 request includes funding to support 225 FTEs at the Idaho Operations Office and 20 FTEs at DOE headquarters that transferred from EM to NE. Request also provides funding for new hires that will strengthen our project management and provide junior staff to support succession planning. This new staff will also help manage expanding research and development in areas such as the Advanced Fuel Cycle Initiative, Nuclear Hydrogen Initiative, and Generation IV initiative (+\$1.2). In addition, the request includes increases for cost of living and promotions (+\$2.0), travel due to expanding research and development programs (+\$0.2), other related expenses due to Working Capital Fund increases (+\$0.9), offset by a decrease in the use of support service contractors (-\$0.9).